FGC Forest Genetics Council of British Columbia

Strategic Plan 2015-2020

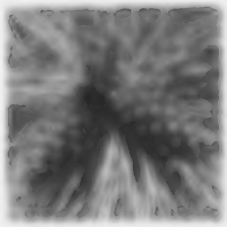


Table of Contents

Introduction 2
Vision 3
Goals 3
Scope 4
Objectives and Outcomes 4
Enabling Objectives 9
Guiding Principles 10
Structure and Membership 11
Society and SelectSeed Company Ltd. 12
Business Planning 13

List of Tables

Table 1. **Council membership structure** 11
Table 2. **Components of overall program funding, source of funding, and anticipated annual needs ($ x 1000)** 14

List of Figures

Figure 1. **The three primary components of Genetic Resource management** 3
Figure 2. **Actual and forecast orchard seed use and gain in volume (GWg) for the period 2005–2022** 7
Figure 3. **BC Forest Genetics Society and SelectSeed Company Ltd. organizational structure** 12
Figure 4. **Committee structure and development of annual FGC Business Plans** 13

National Library of Canada Cataloguing in Publication Data

Forest Genetics Council of British Columbia.
Strategic plan. – 2004/2008-

Quinquennial.
ISSN 1710-3614 = Strategic plan (Forest Genetics Council of British Columbia)

1. Forest Genetics Council of British Columbia - Periodicals. 2. Forest genetics - British Columbia - Periodicals. 3. Forests and forestry – Research - British Columbia - Periodicals. I. Title. II. Title: Forest Genetics Council of British Columbia strategic plan.

SD399.5.B74 354.5'5'09711105 C2004-960033-6

Cover photo credits: B. Jaquish, D. Kolotelo, D. Pigott, W. Strong, J. Woods

This 5-year plan sets out a vision, goals, objectives and performance measures for managing BC's forest-tree genetic resources.

Diane Nicholls
Provincial Chief Forester

Introduction

The Forest Genetics Council of British Columbia (FGC) is a multi-stakeholder advisory body appointed by the Provincial Chief Forester from the provincial and federal governments, forest-sector companies, and universities. FGC's mandate is to advise the Provincial Chief Forester on policy and funding priorities related to the genetic conservation and genetic enhancement of British Columbia's (BC) forest genetic resources - specifically its indigenous tree species. The FGC also provides a forum for stakeholder collaboration to ensure effective program delivery.

This is FGC's fourth consecutive 5-year strategic plan. It builds on previous forest genetic resource management plans which began in the 1960's under the auspices of the Plus Tree Board, and sets out a vision, goals, objectives, and performance measures for managing BC's forest-tree genetic resources. Objectives for conservation, select-seed use, and genetic gain are updated, and a new forest-health objective is added.

This plan also outlines the guiding principles, structure and membership of the FGC, including the process for FGC and SelectSeed Company Ltd. annual Business Plan development.

Resources to support this plan are provided by the Ministry of Forests, Lands and Natural Resource Operations (FLNR), forest licensees, SelectSeed Ltd., the Government of Canada, and Genome BC. Annual contributions from all sources exceed $13 million. These investments contribute to over 50% of the Ministry's service plan performance measure for timber volume gain expected in 65 years (~4 million m^3/yr).

FGC and this plan also support other Provincial initiatives including climate change actions plans and species at risk. For example, FGC will play key roles in implementing new climate-based seed transfer standards and a recovery plan for whitebark pine. Opportunities for assisting with other resource management challenges will also be explored during the term of this strategy.

West Chilcotin
Photo J. Woods.

Vision

BC's forest genetic resources are diverse, resilient, and managed to provide multiple values for the benefit of present and future generations.

Goals

There are three primary and integrated genetic resource management goals (Figure 1):

- **Conservation**, the maintenance of natural levels of genetic diversity for all tree species indigenous to BC;
- **Resilience**, matching seed (genotypes) to planted sites (environments), and maintaining natural genetic diversity in planted populations of trees; and
- **Value**, increasing the timber and non-timber economic value of planted forests.

These goals are achieved through applied research, operational activities, and policies such as the *Chief Forester's Standards for Seed Use* which regulates the collection, registration, storage, selection, and transfer of tree seed used to reforest Crown land.

> The genetic resource of forest trees is the foundation for all economic and ecological values that flow from BC's forests

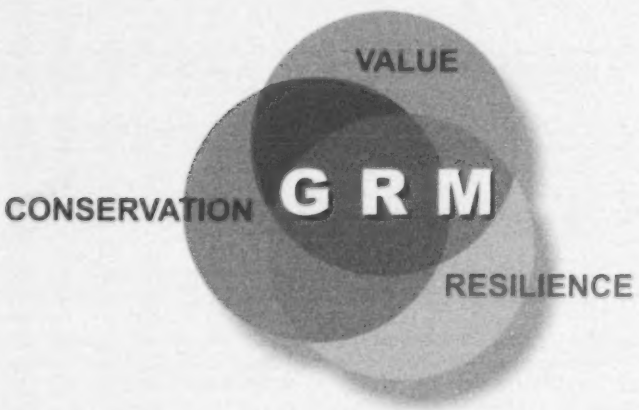


Figure 1.

The three primary components of Genetic Resource Management.

Scope

This strategy applies to all indigenous tree species found in BC's public and private forests, with a focus on the timber-harvesting land base. Parks and protected areas also contribute to FGC's conservation objectives. The scope of this strategy includes research, conventional tree breeding, seed production, pest management, decision-support, extension, and support for new technologies with high potential for application. Genetic engineering is not pursued under this strategy.

Objectives and Outcomes

This strategy applies to all indigenous tree species found in BC forests.

OBJECTIVE 1: Genetic conservation

Outcome: The genetic diversity of all indigenous tree species is adequately maintained to support their continued evolution while providing environmental services and social and economic values.

Performance Measure: Adequately conserve the genetic diversity of representative populations of all forest tree species native to BC by 2020, through a combination of *in situ*, *ex situ*, and *inter situ*[1] conservation.

Effective genetic conservation requires knowledge of population, ecological, and quantitative genetics; a comprehensive inventory of the forest-tree genetic resource; and the systematic identification of species and population priorities for additional conservation. Conservation strategies will need to account for climate change. The FGC will support the development and maintenance of a catalogue of the conservation status for all 42[2] naturally occurring tree species across scientifically defined seed zones. Where the genetic diversity of a species within a zone is determined to be inadequate, additional measures for *in situ*, *ex situ*, *inter situ* genetic conservation will be supported, or recommendations made to appropriate agencies. To meet this objective, the following will be undertaken in the period of this plan:

- Continue to maintain and improve a catalogue of the *in situ*, *ex situ* and *inter situ* status of BC's indigenous tree species;
- Develop conservation priorities and conservation strategies for species whose genetic diversity is determined to be at risk;
- Provide recommendations for maintaining genetic diversity in reforestation seedlots;
- Support conservation measures for species or populations of concern, or make recommendations to appropriate agencies.

Reporting: The genetic conservation status of indigenous tree species within key subdivisions of genetic diversity will be assessed and reported annually.

[1] *In situ* genetic conservation is the maintenance of genetic diversity within naturally occurring tree populations. *Ex situ* refers to the long-term storage of germplasm, typically seeds. *Inter situ* is the maintenance of tree populations in field tests for which genetic information is available.

[2] 42 indigenous tree species are found in BC and are considered in this plan. For this Plan, trees species are defined as readily able to attain a height of at least 10 meters, with a single woody stem.

OBJECTIVE 2: Resilience and climate-based seed transfer

Outcome: Trees are well adapted to the climate of the areas in which they are planted, contain adequate genetic diversity, and form part of diverse forest ecosystems across the landscape.

Performance Measure: By 2020, the selection and transfer of all tree seed used to reforest Crown land in BC will be guided by a climate-based seed transfer system that is regularly updated with new genecology and climate research information.

New climate-based seed transfer standards under development by the FLNR are based on the best available information on patterns of genetic diversity, adaptation, and present and future climatic conditions. These new standards will support the planting of seedlings in climatic areas to which they are genetically well adapted, thereby maintaining and enhancing stand resilience and long-term timber supply.

FGC's role is to review these new policies to ensure that they are operationally efficient, minimize disruptions to seed inventories, and to not unduly increase reforestation costs. FGC will also support genecology research, climate modeling, and other work that advances this objective, including:

- A province-wide climate-based seed transfer system by 2018;
- Progressive, field-based research on the natural patterns of genetic diversity for all species planted in BC;
- Adjustments to FGC programs and information systems in support of priority operational seed production under new seed zones;
- Climate modeling to understand how climate envelopes currently occupied by indigenous tree populations will change over time.

Reporting: Progress on the implementation of a science-based seed transfer policy, that considers climate change, will be tracked and reported annually. The performance indicator will be the percentage of seedlings planted under a climate-based seed transfer policy.

> Information needs for scientifically-based and operationally-efficient seed transfer policy require investments in genecology research and climate modeling.

OBJECTIVE 3: Use of select seed for reforestation

Outcome: Seed of high genetic value is produced in provincial seed orchards to meet select-seed-use objectives.

Performance Measure: Increase select-seed use to 75 percent of the provincial total sown by 2020.

Select material[3] developed in breeding programs attains value through operational seed production, seedling production, and planting. The FGC will facilitate operational seed production and its coordination with seed use and seedling procurement processes through business planning and policy development, and through support of seed production in orchards to meet seed-supply objectives. The following activities will be undertaken in support of this objective:

> Gains in commercial traits require effective tree improvement programs, including tree breeding and seed orchards.

[3] Select seed includes all seed and cutting material with a genetic worth for growth (GWg) or pest resistance (GWr) of greater than 0, including orchard seed (class A) and superior provenance seed (class B+).

Objective 3 continued

- Development and sharing of seed orchard and breeding program technical information;
- Support for needed seed production in orchards;
- Development and maintenance of information systems for seed inventory, ordering, and marketing;
- Development of a seed supply-demand forecasting system for seed planning;
- Facilitation of tree improvement delivery options that maintain and enhance provincial seed production capacity.

Reporting: Progress towards objective 3 will continue to be tracked using the percentage of select-seed use relative to total provincial sowing (Figure 2).

OBJECTIVE 4: Increase genetic gain for growth

Outcome: Provincial tree breeding and orchard programs provide select seed with sufficient genetic gain and diversity to meet objectives for volume-growth improvement.

Performance Measure: Increase the average volume gain of select seed used for Crown land reforestation to 20% by the year 2020.

Gains in commercial traits require effective tree improvement programs, including tree breeding and the coordination of breeding with seed orchard[4] operations. Tree improvement activities will be carried out only in seed planning units[5] with sufficient seed demand and timber-production capacity to warrant investment. Genetic selection will focus on growth traits and pest resistance, with due attention to wood quality traits. The following activities will be undertaken in support of this objective:

- Science-based tree breeding and testing programs for seed planning units meeting investment criteria;
- Development of human resources in the FLNR Tree Improvement Branch to ensure programs are supported by capable expertise;
- Coordination of planning between breeding programs and all provincial seed orchards to ensure the timely upgrading of seed orchards to incorporate the best available selections from breeding programs.

Reporting: Progress towards objective 4 will continue to be tracked using the weighted average genetic worth for growth for all orchard seedlots sown in a given year (Figure 2).

[4] Seed orchards are the primary means for producing select material in British Columbia, however, vegetative production systems are included (yellow cypress).

[5] Seed planning units (SPU) are defined as a specific species / seed zone / elevation combinations. Each breeding program and seed orchard targets a specific SPU.

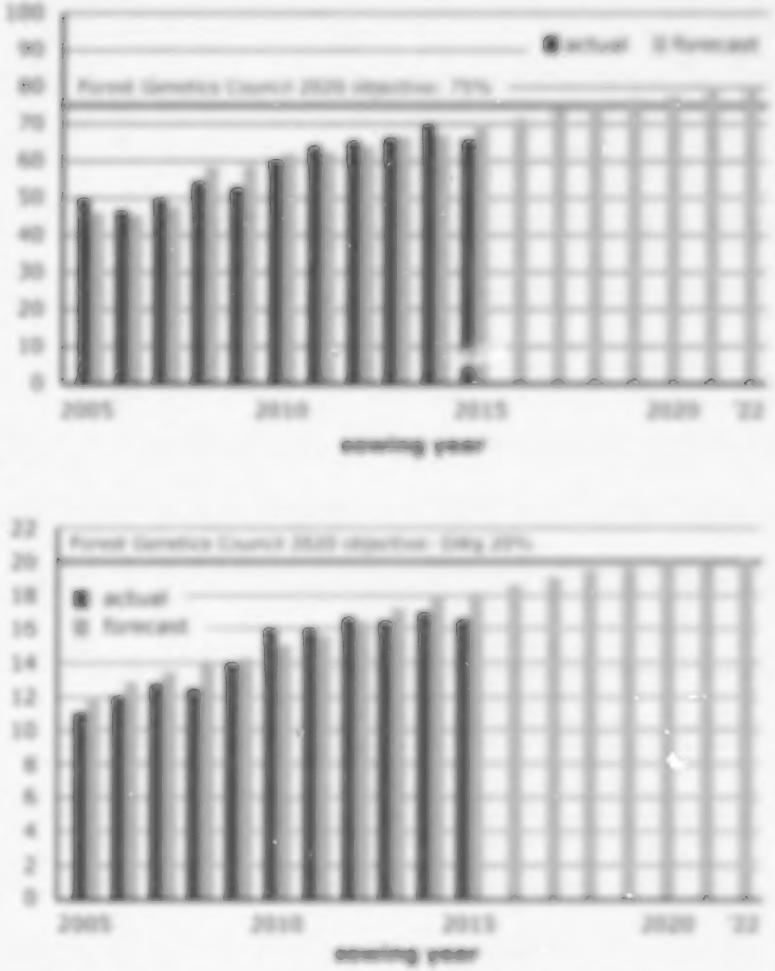


Figure 3:

Actual and forecast orchard seed use (top) and gain in volume (GWg) (bottom) for the period 2005–2022.

[redacted]

OBJECTIVE 5: Use of pest resistance seed for reforestation

Outcome: Provincial tree breeding and orchard programs provide select seed with genetically based pest resistance to address forest health issues.

Performance Measure: Increase the use of seed with a genetic gain for pest resistance to 10% of select seed used by 2025.

Pest damage reduces timber supply and increases reforestation costs. Identifying trees from natural populations that exhibit resistance to specific pests is a practical option to improve forest health. The scale of a pest issue and the potential to select for genetic resistance, with input from forest health specialists and foresters, will guide priority setting for breeding and seed production programs. The following activities will be undertaken in support of this objective:

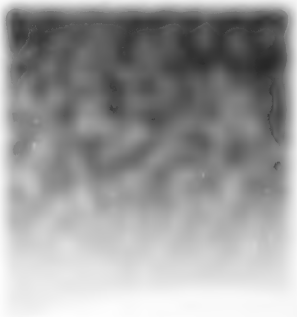
- Invest a component of breeding and seed orchard work under objectives 3 and 4 to develop genetically based resistance to pests of sufficient importance to warrant these investments;
- Support adjustments to seed orchards for specific seed planning units to provide seed options with higher resistance to pests.

Reporting: Progress towards objective 5 will be tracked as the percentage of seedlot sowing with a positive GWI rating relative to total select seed sowing.

Spruce weevil (*Pissodes strobi*) adult on interior spruce. Some spruce genotypes exhibit substantial resistance to weevil damage. Trees are screened in breeding programs for this resistance and selected trees are incorporated in seed orchards where they produce seed with greater inherent resistance to weevil damage.

Photo: M. Strong

Enabling Objectives



Achievement of objectives for Conservation, Resilience, and Value requires activities in support of business planning, communications, extension, information management, and policy development. Such activities execute as integral part of all projects and specific activities are identified as needed in support of the primary program objectives.

OBJECTIVE E: Resources and efficiency

Outcome: Secure resources and coordinate stakeholder activities to efficiently meet Business Plan priorities.

By setting clear strategic goals and objectives and by annual business planning, the PAC will:

- Anticipate and procure the resources needed to meet objectives;
- Develop program structure and resourcing to minimize reliance on annual program funding sources;
- Strive for self-financing of select seed production through seed sales;
- Coordinate stakeholder activities for efficient program delivery.

OBJECTIVE F: Monitor and report

Outcome: Monitor and report progress for genetic resource management activities.

Performance measures: Annually produce a Business Plan, Annual Report, and Project Report.

Business planning will include systems for monitoring and annually reporting progress at the provincial and project levels. Annual reporting will quantify progress to provincial level objectives set out in this plan. Project level reporting will summarize the progress for all projects outlined in annual Business Plans.

Guiding Principles

The following principles will guide CBR strategies, programs, and the development of annual business plans.

- Invest in cooperative and collaborative approaches among stakeholders.
- Recognize CBR as an integral element of sustainable forest management.
- Respond proactively to environmental, social, economic, and technological changes.
- Promote the best science to achieve and guide policy.
- Exercise open and inclusive communications.
- Measure and leverage performance, and continually improve policy and practices.
- Employ best business practices.
- Respect the independence of collaborating stakeholders and work programs while remaining true to core CBR values, stakeholder business objectives, and

[illegible] forest [illegible] production in a [illegible] of open-canopy [illegible] [illegible] [illegible]

Structure and Membership

[illegible]

[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]
[illegible]		[illegible]

Society and Subsidiary Company Link

Figure 1.1

Society and subsidiary company link

Business Planning

FGC Business Plan development

Council will develop a Business Plan annually and report on progress using performance indicators. Figure 4 illustrates the relationship among Council, subcommittees, and Business Plan development.

Figure 4.

Committee structure and development of annual FGC Business Plans.

> Council will annually develop a Business Plan and report on progress using performance indicators

Program resourcing

Funding for this cooperative provincial program is critical in both the near and longer term. With long-term objectives and with programs that often take many years to reach fruition, stability is important. Different program categories are

supported in different ways, but all are essential to meeting the vision and objectives set out in this plan.

Orchard seed production and tree breeding are the primary cost areas for this integrated provincial program. Seed-sale revenue provides the largest single contribution to orchard operations. FLNR base funding pays for tree breeding, research sites, and policy. LRDS funding supports a variety of activities, including project funding for tree breeding and genecology research. Revenue from SelectSeed Ltd. seed sales is directed back to the FGC to support management, extension, and technical activities, including some tree breeding. Industry, Universities and the CFS provide in-kind and direct support for a variety of projects. GenomeBC and Genome Canada provide project-level support for genomics research.

Table 2. **Components of overall program funding, source of funding, and anticipated annual needs ($ x 1000).**

Program area	Non-LRDS funding sources	LRDS support	Other support
Genetic conservation	FLNR base; University; CFS; NSERC	250	100
Tree breeding	FLNR base; GenomeBC; industry in-kind	1,300	3,500
Genecology and seed transfer	FLNR base; CFS; NSERC	570	150
Seed production in orchards	Seed sales	550	6,000
Seed and cone pest management	Private orchards; SelectSeed Ltd.	200	200
Extension	FLNR base; all cooperators	30	50
FGC program management services	SelectSeed Ltd.	0	150
Policy and Crown-land records	FLNRO base	100	300
Total funding need		**3,000**	**10,450**

Program funding includes both public and private sources.

Class A western redcedar seedlings being grown at the Western Forest Products nursery in Saanich.

Photo: J. Woods